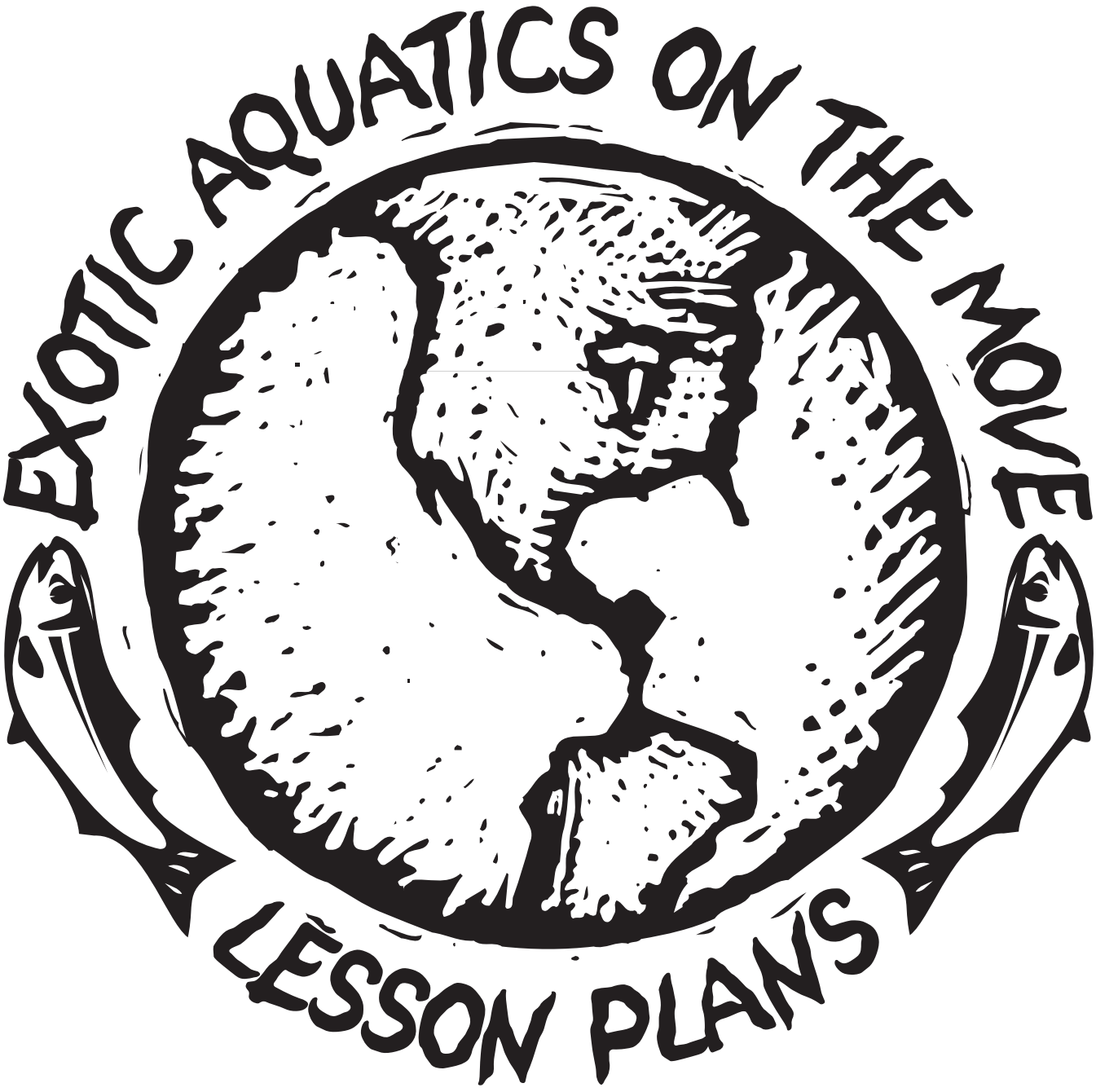

Sea Grant

How Do Scientists Use The Scientific Method To Study The Invaders Of The Great Lakes?

Grade Level: 7th grade

Overview

In science class, students will work in groups to research a problem with an invader of the Great Lakes and then use the scientific method to design an experiment to test their hypothesis.

Author
Jennifer K. MacDonald

School
Fredonia Middle School

City
Fredonia

State
New York

Grade Levels Taught
7th – 8th Grades

Background

While students are exploring the steps of the scientific method, they can make a real life connection by using invading species as their focal point of concern. The scientific method is addressed in the New York State Learning Standards. Not only do students learn about the scientific method and invaders of the Great Lakes, but they also get a chance to create and possibly execute their own scientific experiment. Through problem solving, inquiry, and cooperative learning students become scientists in this journey.

Setting

Science lab or possibly outside at the location of their experimental testing.

Objectives

When the learners have completed this activity, they should be able to:

1. Follow the steps of the scientific method by designing their own experiment to test their hypothesis about a problem with an invader of the Great Lakes.
2. Possibly execute one of the experiments in class.
3. Evaluate the experiments they created.

Geographic Standards

Standard 15. How physical systems affect human systems

Standard 16. The changes that occur in the meaning, use, distribution, and importance of resources

Science Standards

Inquiry: Depending upon the topic/ problem/experiment chosen by each group, students will be addressing certain standards related specifically to their research areas.

Keywords

Scientific method, observations, hypothesis, experiment, data, research, variable, control, theory, law, invader, exotic species, vector, nonindigenous species, Great Lakes, sea lamprey, zebra mussel, purple loosestrife, round goby, alewife

Materials

For groups of three to four students: paper, markers, colored pencils, computers, Internet access, word-processing programs, spread-sheet programs, resources on invaders, supplies for experiments

Schedule

Day 1: Instructions, Keywords, Scientific Method Sample, and Group Formations.

Day 2: Assign roles in groups, brainstorm, identify problem with invader, and begin designing an experiment.

Day 3: Continue experimental design, gather information (library, Internet, books, etc.), and create a hypothesis.

Day 4: Map out experiment and predict results.

Day 5: Create charts, tables, graphs and a lab report.

Day 6: Present experiments to class and vote for the best experiment.

Day 7: Try to simulate or execute one or several of the experiments in the lab to review the scientific method.

Prerequisite Skills

Students should have a basic idea of the scientific method and invaders of the Great Lakes.

Curriculum Connections

Science: Scientific method and biological studies of invaders.

Math: Measurements, data collection, and graphing.

Social Studies: Impact of invader problem on our community (economically, socially, recreationally, biologically, and geographically)

English: Research techniques, scientific method write up, and vocabulary.

Technology: Use of computer and design of experiment.

Art: Drawings and graphics.

Careers: The many different types of scientists.

Extensions

Guest speakers from and/or field trips to the Department of Environmental Conservation, Aquarium, Sea Grant, and/or local colleges or universities.

Procedure

1. Anticipatory Set—Tell students that they are going to be scientists for the next week or so. Go over the different kinds of scientists who study the Great Lakes. Give each student a strip of paper with the name of a particular type of scientist on it. For example, Biologist (a person who studies life), Chemist (a person who studies chemistry), Geologist (a person who studies the earth), Botanist (a person who studies plants), Zoologist (a person who studies animals), Aquatic Biologist (a person who studies life in the water), Liminologist (a person who studies lakes), Ichthyologist (a person who studies fish), Microbiologist (a person who studies microscopic life), etc.
2. Ask students if they know what that scientist they selected studies. Have students raise their hands if they think they know what their scientist does. Tell the other students that it is OK if they don't know anything about their own because there are so many different kinds of scientists in the world– they all study different things and have different names! Have students check with their partner to see if they can figure them out together. Use numbers on the back of the strips to divide students into groups. Once in the groups, encourage students to share their scientist with each other and once again cooperatively figure out their roles. Have a class discussion about the different kinds of scientists and how they work together to help us learn more about the Great Lakes.
3. In their groups go over directions to the activity. Students are to work together to develop an experiment to test a problem with a Great Lake invader. You can do this in one of two ways. You can either jigsaw this project by randomly assigning an invader to each group or just allow the students to choose any invader they want.
4. Use the tentative schedule provided to see what the groups should be working on each day.
5. When the students have completed their projects have them present to the class. You can have the students vote on the best experiment and try to simulate it in your lab to review the steps of the scientific method. There may be some experiments that can be modified to be conducted in your lab.

Teacher Notes

Assign groups heterogeneously or form them randomly.

This lesson plan is flexible in many ways. You can take as much time as you want to work on this lesson in your own classroom and take ideas from it to modify for your students.

Allow students to think as scientists do. If their thinking and their experiments go way beyond your lab, it is fine. As long as their experiments are scientifically sound it is acceptable for them to imagine themselves with resources that may not be readily available in your room. You can decide whether or not you want them to think realistically or use their imaginations.

Applications

Execute and refine.

Evaluation

Students will evaluate each other's research projects. They are to provide positive feedback and constructive criticism. Students should fill out an evaluation form for each group's presentation and a class discussion should follow each presentation.

Credits

Prepared by author.

GREAT LAKES INVADERS AND THE SCIENTIFIC METHOD

(Designed after the New York State Math, Science, and Technology Test Pilot of 2000)

1. Planning Page

   Brainstorming with Group
   - Invaders
   - Problems with Three Invaders
   - Hypothesis
   - Experiments To Do

2. Project Page

   Designing Experiment
   - Topic/Invader
   - Problem
   - Gather Information
   - Hypothesis
   - Test Hypothesis/Experiment
   - Materials
   - Design
   - One Picture/One Table/One Graph
   - Variable/Control
   - Data
   - Analysis
   - Conclusion

3. Reflection Page

   Reflection Log/Journal
   - Working with Others
   - How's it Going?
   - Feelings about Project
   - Predictions

4. Evaluation Page

   Within Group and with Other Groups
   - Positive Feedback
   - Constructive Criticism

The Exotic Aquatics on the Move project is funded through the National Sea Grant Office in partnership with Illinois-Indiana, Louisiana, Minnesota, Ohio, New York, and Washington Sea Grant programs. Ohio Sea Grant has developed a website related to the Exotics Aquatics on the Move workshops at http://www.ag.ansc.purdue.edu/EXOTICSP/.

The National Sea Grant College Program is a network of 30 Sea Grant programs in the coastal and Great Lake states that encourage the wise stewardship of our marine resources through research, education, outreach, and technology transfer. Our federal partner is the National Oceanic and Atmospheric Administration (NOAA) located in the Department of Commerce. Sea Grant s a partnership between the nation's universities, industry, government and the public. More information on the National Sea Grant College Program can be found at: http://www.nsgo.seagrant.org

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Exotic Aquatics on the Move

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